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INDIAN FISHERIES BULLETIN

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Indian fisheries

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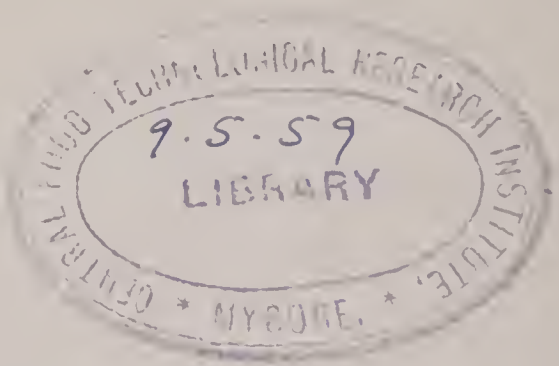

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"LOBSTERS"

INDIAN

GENERAL AND DEVELOPMENT

Recommendations made at the All-India Fisheries Conference, Madras—19th and 20th September, 1956.

At the All-India Fisheries Conference held at Madras on the 19th & 20th September, 1956, for coordinating the various programmes of fishery development in the country to increase fish production, the following resolutions were adopted by the Conference:—

1. Development of Inland Fisheries

(a) (i) **Increase in fish seed production**

Considering the great need for increased fish seed production in view of the increasing demands from fish farmers,

Resolved that:

(1) the Departments of Fisheries undertake measures for conservation of brood fish, fish eggs and spawn, fry and fingerlings by—

(a) declaring close fishing season in selected pools;

(b) intensifying prospecting for natural shelters of brood fish, seed collection centres and swamps with fingerlings;

(c) acquiring fishing rights over breeding and collection grounds and swamps;

(2) Co-operative and Private enterprise be encouraged to take up the work of spawn and fingerling collection by—

(a) settling collection rights with such parties at fair rates;

(b) giving a subsidy in the initial stage in the form of collection equipment and bonus on production; and

(c) establishing central purchasing and packing units to assure a market to the producers;

(3) steps be taken to establish communications to collection grounds and swamps;

(4) the Central extension units undertake rapid establishment of experimental collection parties in States, where such facilities do not exist at present;

(5) States with potentialities of fish seed production be encouraged to supply to other States and be given suitable bonus on such supply; and

(6) that Central and States Fisheries Institutions intensify their researches particularly on selective breeding in bundh type of tanks and establish fish breeding farms.

(a) (ii). Settlement of Inland Fisheries

Considering the importance of optimum production from culturable water areas and its close relationship with the mode of settlement of fishing rights;

Resolved that:

(1) as far as possible, fishing rights of inland waters be settled with fishermen's cooperatives and fishermen by profession capable of making the best use of it;

(2) system of auction by Government Departments or the Gram Panchayats be stopped and settlement made either by negotiation or fixation of equitable rates of royalty on the basis of production;

(3) increasing the term of the lease to a suitable period to enable the lessee to take up minor developmental works; and

(4) subleasing of fishery rights should be discouraged by the lessees.

(a) (iii) Facilities for supply and quick transport of fish seed

Considering that increased fish seed production at source requires adequate transport facilities;

Resolved that:

(1) Fisheries Departments be equipped with adequate number of mobile packing and transport units (trucks, tractors and jeeps with trailers and boats) for marketing and movement of spawn and fingerlings from source;

(2) specially equipped rail vans be provided at suitable rail heads for long distance fry transport;

(3) the Railways be requested to continue to provide facilities by accepting fish seed consignments for transport at quarter parcel rates in passenger compartments on fast trains, preferably by Mail or Express at short notice, without any additional charges; and that

(4) The Ministry of Communications be requested to examine the possiblity of reducing air freight rates for transport of live fish seed, fry and fingerlings for culture purposes.

(b) Introduction of Exotic fishes for culture

Having considered the desirability of cautious approach to the introduction of exotic fish, like Tilapia, as recommended by the Standing Fisheries Research Committee;

Resolved that:

(1) The State Governments should co-operate in implementing the recommendation of the Standing Fisheries Research Committee accepted by the Government of India and desist from introducing Tilapia in areas other than permitted; and

(2) exotic fishes are introduced only after the probable effects of these fishes on the indigenous fisheries are carefully investigated by authorised agencies.

(c) Fisheries development in River Valley Projects and establishment of River Valley Fishery Boards

In view of the importance of fisheries development in large impounded water areas and the effect of impounding on the river fishery as a whole;

Resolved that:

(1) the Ministry of Food & Agriculture and State Departments of the Fisheries be given adequate representation on river valley control and development boards from the stage of planning; and

(2) the development of fisheries be entrusted to an unified agency subject to advise from an Advisory Board in which the State Department of Fisheries will be represented.

(d) Establishment of a Water Pollution Board

Having considered the importance of the problems of water pollution by factory effluents as well as sewage with the increasing industrialization of the Country;

Having accepted the recommendations of the ad hoc Fisheries Research Committee for the constitution of a Central Water Pollution Board; and

Having considered the desirabillty of adopting adequate measures on an All India basis to control the pollution of rivers and prevent damage to the fisheries;

Resolved that:

(1) suitable steps be taken up immediately to study the various problems connected with the pollution of waters by industrial wastes and other effluents and their bearing on fisheries, and take suitable remedial measures, as early as possible.

(e) Conservation of fisheries and legislative measures for the utilisation of derelict and fallow waters.

Considering that reclamation and Fish Culture in swamps is of great importance in our rural economy;

Resolved that:

(1) swamps and fallow water areas with single or multiple ownership be suitably acquired by State Governments by legislation, if necessary.

(2) capital equipment and technical knowledge be made avaiiable to State Fisheries Departments in reclaiming them and taking up Fish Culture; and

(3) the existing conservation measures be reviewed and a uniform policy be adopted in a region for effective implementation.

II. Development of Marine Fisheries

(a) Mechanisation of fishing craft—

(i) Exemption from the payment of Duty on Fuel Oil

Having considered the necessity for providing adequate facilities for small power craft and to promote the progress of the mechanisation of fishing craft in the early stages;

Resolved that:

(1) The Government of India be requested to exempt the payment of duty on fuel and lubricating oil used in small power fishing vessels; and

(2) the duty-free fuel be supplied to fishermen owners of small mechanised craft through Government agencies or through Fishermen Co-operative Societies to their members.

(b) Fishing Vessels and Indian Merchant Shipping

Having considered the necessity to meet the requirements of power fishing vessels:

Resolved that:

(1) the proposed draft rules for life saving appliances and fire equipment in connection with the fishing craft be examined further by the technical officers of the Ministry of Food & Agriculture and then discussed with the Ministry of Transport with a view to making the rules suitable for meeting the requirements of the fishing industry;

(2) the small mechanised fishing vessels be exempted from the enforcement of difficult provisions of the rules of the Indian Merchant's Shipping Act and Load-Line Survey for fish transport;

(3) the mechanised fishing vessels be exempted from the payment of wharfage and port dues;

(4) these power fishing vessels be exempted from port clearance formalities;

(5) the fish carrying vessels under 45 in length shall carry only life jackets and lights, sound signals and fire extinguishers; and

(6) the Load-Line Rule be relaxed to restore permission to transport mangoes or other perishable food articles in fish carrier launches during the off-season for fishing.

(c) Establishment of Fishing-boat Building Yards

Having considered the increasing demand for fishing craft of different types and for mechanised fishing boats and necessity to meet this demand;

Resolved that:

(1) boat building yards be established in fishing centres under expert supervision for the construction of redesigned sailing and power fishing craft suitable for the area in which they will operate;

(2) the yards be established by the State Governments or Co-operatives partly financed by the Centre;

(3) that the yards be adequately equipped for installation of engines and for servicing; and

(4) the Government of India be requested to set up as soon as possible training courses in fishing boat designing and building and management of boat yards.

(d) Import of 'catamaram' logs and cultivation of timber trees for fishing crafts

Having considered the need for the maintenance of "Catamarams" till such time as suitable surf landing crafts are designed and established for gradual replacement and in view of the difficulties experienced by the coastal fishermen in obtaining them at a reasonable cost;

Resolved that:

(1) Madras State should develop plans for raising suitable timber plantations for "catamaram" logs;

(2) "catamaram" logs be continued to be included as an item of import from Ceylon; and

(3) exemption from customs duty be granted in view of its restrictive use by a small fishermen community dependent entirely on it for their livelihood.

(e) Development of Fishing Harbours

Having considered the necessity of providing docking and landing facilities for fishing vessels without which no real improvement of the fishing industry is possible and appreciating the sympathetic consideration of the Minor Ports Committee of the Ministry of Transport on the development of fishing harbours;

Resolved that:

(1) the Government of India and the State Governments take adequate measures, as early as possible, to improve the present docking and landing facilities and also improve the fishing harbours;

(2) some docks be reserved exclusively for the fishing industry;

(3) first priority be given to the needs of the fishing industry for warehouses, godowns and the land on the water edge in the dock areas;

(4) the present schedule of charges levied by the Port Trust authorities on fishing vessels be appreciably scaled down to promote expansion of the industry, in the early stages, especially in view of the fact that the charges are the same as those applying to large ocean going cargo ships;

(5) the Government of India be requested to take a considerate view of the legitimate claims of the fishing industry and ensure the provision of special dry dock and slip-ways for the removal of marine encrustations and for repairing and painting the bottoms of ships, and that such facilities be provided at Victoria Bundar in Sassoon Dock, Bombay, Tuticorin, Cochin, Madras, Veraval and other fishing centres; and

(6) that the Minor Ports Committee of the Ministry of Transport coordinate the efforts of fisheries experts on Harbour Science in development and maintenance of important fishing ports in the country.

III. Development of Fish Preservation and Utilisation of Fishery Products.

(a) Regulations to improve fish curing

Having considered the desirability of providing improved quality of fish and fishery products and to protect the interests of both the producers and the consumers;

Resolved that:

(1) fish curing and processing, such as salting, drying and pickling be permitted only in suitable premises approved and/or licensed by Government and subject to technical inspection by the Government Officers;

(2) icing, chilling and freezing for commercial purposes be permitted only in suitable centres subject to periodical technical inspection by the Government Officers;

(3) the attention of the Central Committee for Food Standards, Ministry of Health be drawn towards the need for constituting a Sub-Committee to evolve quality standards for marine food products;

(4) proper administrative machinery be set up for enforcing the standards; and

(5) proper standards and definitions be evolved for different fish by-products, such as fish-meal, fish-oils, fish-manure, fish-guano etc.

(b) Utilisation of sea-weeds

Having considered the necessity for proper utilisation of sea-weed resources;

Resolved that:

(1) a comprehensive survey of the sea-weed resources of the country be carried out in different maritime States; and

(2) steps be taken by State Governments having sea-weed resources for development of sea-weed industry, and for organising the supply of raw materials and marketing the final products taking advantage of the training courses in sea-weed cottage industry provided by the Ministry of Food and Agriculture to the candidates sponsored by the State Governments and National Extension Service.

IV. Marketing and Transport of Fishery Products

(a) (i) Development of the Prawn trade

Having considered the need for fully exploiting available markets for frozen and semi-dried prawns and also for developing new markets both inside the country and overseas, and having regard to the uncertainties of the existing overseas markets;

Resolved that:

(1) the problems of ensuring a regular and adequate supply of prawns, particularly for freezing and canning for export, be examined

and, with this end in view, mechanised trawling be adopted as quickly as possible;

(2) facilities be provided for the processing and packing of semi-dried prawns under hygienic conditions, so as to conform to acceptable standards; and

(3) the possibilities of developing an internal market for semi-dried, fully dried, canned and pickled prawns be explored, laying particular emphasis on propaganda for the purpose.

(a) (ii) Marketing of fish and fishery products

Having realised the necessity for organisation of marketing of fish for the benefit of the producer and the consumer and to meet the requirements of the increasing production of fish for efficient distribution and consumption:

Resolved that:

(1) the Central and State Governments provide financial assistance in the form of loans for establishing new markets in accordance with modern principles for handling large catches expeditiously and efficiently;

(2) the State Governments set up depots with attractive refrigerated display cabinets with a wide choice of marine products; and

(3) extension and propaganda work be undertaken for popularising fish food;

(b) Facilities for quick transport of fish

Having considered the need for marketing fish quickly and in a better condition,

Resolved that:

(1) the Railways be requested to introduce refrigerated rail vans on all routes connecting important landing centres and areas of consumption in a phased programme, and the Government of India may consider subsidising the operation of these vans in the early stages;

(2) fish be transported by fast trains on all railways;

(3) the quotas allowed for the transport of fish at the various stations. be made more flexible during the different fishing seasons, with provision for increasing the quotas, where necessary;

(4) the freight rates for fish be fixed at quarter parcel rates in view of its highly perishable nature;

(5) the State Governments should undertake suitable measures to improve facilities for the transport of fish by road, such as. construction of feeder roads from fish landing centres to the railheads; and

(6) facilities be provided for developing the traffic of fish by carrier launches.

V. Organisation of Fishermen Cooperative Societies

Having recognised the importance and immediate necessity of improving the living conditions of fishermen and organising them into strong and viable

cooperative societies for taking effective steps for the development of fishing industry in general and increasing production of fish in particular;

Resolved that:

(1) assistance be given to fishermen on a liberal scale in the same manner as the handloom weavers, so that they may contribute to the share-capital of cooperative societies and raise sufficient working capital, as they are very poor and have usually no capital of their own, and "the National Cooperative Development Funds" and "State Cooperative Funds" be utilised for the purpose;

(2) all the facilities recommended by the All India Rural Credit Survey Committee be extended to the co-operatives of Fishermen, who are producers of vital food in the same manner as to the Agriculturist Co-operatives and in particular financial help be given in the initial stages to the societies towards meeting the cost of management;

(3) all programmes connected with production, storage, transport, processing and marketing of fish and credit requirements of fishermen be financed by the Cooperative Banks and the Reserve Bank of India and the terms of such finance, such as, rate of interest, security etc. be not less favourable than in the case of agriculture;

(4) State Governments consider the leasing of fisheries under their control to fishermen co-operatives, wherever they exist, at reasonable rates for fairly long periods, say three to five years, with option of renewal subject to efficient working of societies and proper maintenance of fisheries instead of putting the fisheries to public auction, wherever justified, the State Governments may in addition to the lease amount collect royalty on the catch on maundage basis;

(5) Wherever possible, preference be given to genuine fishermen co-operative societies for marketing of fish;

(6) in regard to organisation, supervision and administration of co-operative societies, the Fisheries and Cooperative Departments of State Governments work in close co-ordination with each other and such arrangements, as far best suited to local conditions, be made in each State; and

(7) the State Governments take all possible steps to educate the fishermen in cooperation and undertake suitable programmes for the purpose as the success of Fishermen's co-operatives will largely depend on the understanding of the principles of co-operation by fishermen.

VI. Fisheries Training, Extension & Co-ordination

(a) Training of personnel for implementing the programmes of fisheries development

Having considered the vital importance of a well planned and comprehensive training programme of personnel at all levels for proper implementation of the Fisheries Development Plans and;

Realising the quantitative as well as qualitative inadequacy of the existing training arrangements, with their greater stress on theory than on the techniques of fishing as an industry.

Resolved that:

(1) Universities and research institutions be encouraged by financial assistance and where required, to take up post-graduate courses in the science of fisheries, provided they include in their curriculum adequate practical training;

(2) except in regard to posts requiring specialization only in research and scientific studies, Governments employ in the fisheries departments, particularly on the extension posts, only those persons who have done intensive practical work for at least one year, on the seas and/or inland waters, as a part of their regular training for a diploma in fisheries, the training courses being suitably modified to satisfy this requirement;

(3) all senior supervisory personnel already in Government employ, who have not received practical training or done actual work as indicated in the preceding para, be given in service practical training and periodical refresher courses according to an *ad-hoc* programme to be completed expeditiously;

(4) arrangements be made for requisite general and practical training, in improved techniques and use of improved equipment and accessories, to the subordinate departmental employees and to fishermen. These certificate courses should be framed with due regard to the students' low academic qualifications or even illiteracy;

(5) special training courses be started to turn out skilled fishermen and staff to drive powered motor-boats and to navigate without infringing upon the special provisions of the Indian Shipping Act and other relevant laws enacted for the fishing vessels;

(6) arrangements be made immediately for extensive and comprehensive training to personnel for larger vessels such as trawlers and purse-seiners;

(7) training at all levels include, where required, visits to and actual work at places outside the State and if necessary, outside the country too. In the latter case, full and judicious use should be made of facilities provided under several foreign aid schemes for securing foreign experts and for foreign training to our nominees; and

(8) a high-power Standing Committee for Fisheries Training Programme be set up to entrust it with the responsibility of

(a) a rapid and rough assessment of requirements of trained personnel of various categories such as scientists, extension officers and instructors, subordinate officials and fishermen (both skilled and unskilled), foreign experts and local officers to be trained in or outside the country;

(b) preparing detailed and coordinated programme of imparting requisite training to the required number within a time schedule; and

(c) necessary funds for the purpose of implementating the aforementioned programme, be placed at their disposal by the Central Government as in the case of the Central Committee for Co-operative Training.

(b) Fishery library facilities and exchange of information between Central and State Fishery Agencies

Having considered the usefulness of the exchange of information on fisheries work conducted by the Central and State Agencies and Institutions, both for accelerating the progress and for avoiding duplication of efforts,

Resolved that:

(1) in the matter of literature and information on the subject of fisheries, the coordination be completed between the various Institutes, Research Centres and the Governments; and

(2) a Central Agency be established to collect and disseminate this information.

(c) Coordination of extension activities of the Central and State Governments

Having realised the necessity of regional Extension Units, proposed to be set up by the Central Government for applying the results of most up-to-date researches,

Resolved that:

(1) the State Governments be requested to cooperate fully with the activities of these units, to make them a success; and

(2) the units carry out their programme in constant consultation and coordination with the State Fisheries Departments concerned and provide brief refresher courses for the State Fisheries Department Staff to acquaint them periodically with the most recent developments in Fisheries science.

(d) Formation of a Central Fisheries Advisory Council

Having considered the need for integrating and coordinating Fisheries Research and Development activities in the country,

Resolved that:

(1) A Central Board of Fisheries be established with a Standing Committee to meet more frequently, say once in three months, to consider fisheries problems thoroughly and provide guidance to the States.

VII. Research and Statistics

(a) Having noted with satisfaction that the Union Ministry of Food and Agriculture has set up a Central Fisheries Research Committee to review and coordinate Fisheries Research that is being carried out in the country,

Resolved that:

(1) this Committee should hold more frequent meetings in different regions of the country and co-opt members from State Governments and Universities that are engaged in active fisheries research in those regions;

(2) the need for Central and State Governments to implement the recommendations made by the Fisheries Research Committee, from time to time be impressed on them and special attention be

invited in this connection to the recommendations of the Committee regarding Tilapia and the data relating to catches by powered fishing vessels;

(3) efforts be made to strengthen fisheries research and the machinery for extension of results of researches. The Central Stations should pay special attention to long range problems of a Regional or All India character and the State Research Stations should specialise on short-range problems of local importance directly related to State Fishery Development programmes; and

(4) suggest the speedy implementation of the recommendations of the *Ad-Hoc* Fisheries Research Committee which have been accepted by the Government of India.

(b) Having regard to the urgent need for reliable statistics as an essential pre-requisite for proper development in the sphere of fisheries,

Resolved that:

(1) steps be taken by the Directorate of N.S.S. to expedite development of suitable techniques for the estimation of catches, particularly for inland fisheries;

(2) for bringing out the main features of fisheries economy, the Directorate of N.S.S. undertake quin-quennial socio-economic surveys;

(3) the Directorate of Economics and Statistics in the Ministry of Food and Agriculture organise collection of regular data on economic and Commercial Intelligence pertaining to fisheries and potential resources in the States;

(4) the State Governments examine the possibility of licensing all fishing craft and gear (with nominal fees or without fees), as a means of obtaining fishery statistical information relating to potential resources;

Till the finalisation of the techniques by N.S.S. for the estimation of inland fish catch, the State Governments may endeavour to furnish approximate estimates of inland fish catches based on fishing units;

(5) the existing Central and State Fishery Organisations continue and expand their activities for the collection of fishery statistical data and new schemes for the collection of statistics be developed in areas not covered by existing work;

(6) while States with adequate fishery organisations may utilise them for collection of data, other States may collect information through other departmental agencies or through village level workers in the N.E.S. blocks and Community Projects areas;

(7) the Central and State Governments evolve suitable proformae for this purpose, lay down procedures and develop suitable yardsticks;

(8) the collection of fisheries statistics in the States on a uniform basis be coordinated by the Central Ministry of Food and Agriculture. The Directorate of Economics and Statistics will be responsible for the publication and dissemination of statistical information on fisheries; and

(9) the Resolution envisaged above may be implemented, as early as practicable, so as to ensure the availability of fishery statistics on an All-India Scale during Indo-Pacific Fisheries year, 1957-58.

GENERAL.

Having considered the necessity for effective coordination of various activities relating to fishery development, in view of the necessity to increase fish production to meet the protein requirements, in view of the fact that increase in fish production is independent of the pressure on agriculture and land, and in view of the need for accelerating programmes of fishery development at a greater pace,

Resolved that:

(1) the fishery departments be considered as development departments and not as revenue departments; and

(2) State Governments set up independent Departments for fisheries development, where they do not exist already.

Marine

(i). Report on the working of the two Cutters 'M.T. Ashok' and 'M.T. Pratap' and the Japanese Vessel 'Taiyo Maru-17' during the fishing season 1953-54.

The report embodies the results of the trawling work done on a commercial scale by the Japanese trawler and the exploratory Bull-trawling initiated by the Government of India Cutters 'M.T. Ashok' and 'M.T. Pratap' under the supervision of Japanese technicians during 1953-54. While the results of this commercial venture disproved all previous beliefs that trawling in Indian Waters cannot be a commercial success, the results of the exploratory work of "Ashok" and "Pratap" have indicated from the results obtained that Bull-trawling yields better results than Otter-trawling in the same grounds.

The fishing grounds, where operations were carried out during the fishing season of 1953-54 are in 5 acres within the Bombay region in the south and Dwarka region near the Gulf of Cutch in the North.

Fishing effort.—Taiyo Maru 17, commenced its operations in September 1953 and stopped fishing towards the end of July, 1954. Except during June and July, 1954, this vessel has been staying out for more than 20 days in each month. More than 2/3 of the time out of port has been spent in actual fishing and the maximum number of hours has been spent in the Dwarka Region; where trawling has been done for nearly 2280 hours (59 per cent of the total fishing time) for the whole season. The second best exploited is the Gulf of Cambay Region.

Fish landings.—The total quantity of fish landed for the whole season has been estimated to be 21,21,760 lbs. Sciaenids form the highest percentage of the total landings being 40·6 per cent, Eels 14·8 per cent Polynemids 12·3 per cent, Snappers 8·5, Cat fishes 6·9 per cent, Elasmobranchs 9·1 and other fishes 7·8 per cent.

Analysis of the catch in different months shows that except for June and July, the landing has been good. Between November and February the bulk of the landings consisted of Sciaenids and Polynemids; in September, October, June and July Sciaenids and Eels. Snappers in November and from March to May formed important features of the catch.

The maximum yield of fish has been from Dwarka Region and the yield was particularly good in Veraval Region in September.

"SHRIMPS"

The relative abundance of individual groups of fishes varies a great deal from region to region. Polynemids are seen to be most abundant in Dwarka Region, and Eels in Bombay and Gulf of Cambay Regions, and Snappers in Porbunder and Dwarka Regions. Sciaenids seem to occur in all the regions. In assessing the relative productivity of the different regions it must be emphasized that not all the regions were visited by the trawler during all the seasons of the year.

The Cutters 'M.T. Ashok' and 'M.T. Pratap' commenced the Bull trawling operations in December, 1953, and closed for the season towards the end of May, 1954. The Bull trawl is essentially a two-boat trawl which is being widely used in Japan and Philippines. In this operation, the net is dragged by two vessels which keep the correct distance apart to spread the two 'wings' properly. This net is of a large size and sweeps a much wider area of the sea bottom than the otter trawl. As the two boats operate together as one Unit, they are treated as such in the analysis of their catches also.

The actual period of fishing operations was only 6 months. These vessels stayed out of port for 103·7 days and fished for 704·9 hours; the actual trawling time is only 28·3 per cent of the total time spent out of port. The fishing has been concentrated in Dwarka Region, nearly 69 per cent of the total fishing having been done in this region.

Fish landing.—The total quantity of fish landed by the Cutters is estimated to be 8,06,400 lbs., the catch per day's absence from port being 7,776·2 lbs., and overall catch per trawling hour works out to 11,43·9 lbs. The composition of the catch is Polynemids 26 per cent. Sciaenids 13·7 per cent. Eels 7·6 per cent. Snappers 15·3 per cent. Cat fishes 9·3 per cent. Elasmobranchs 12·5 per cent. and other fishes 15·6 per cent.

The landings of Polynemids and Snappers are higher and Sciaenids and Eels lower than in the catch composition of Taiyo Maru. The low catch of Eels may be due to the fact that the cutters did very little fishing in Gulf of Cambay and Veraval Regions and their fishing operations also commenced late.

A very high percentage of landings of Polynemids from December to February and a fairly good percentage of Sciaenids throughout the season have been recorded.

The best fishing returns are from Dwarka Region, the catch per hour in this region being about 137·4 lbs. Veraval and Porbunder Regions show results similar to those obtained in the case of Taiyo Maru.

With reference to individual groups of fishes, Dwarka region is seen to be good for Polynemids, Sciaenids and Snappers, while Bombay and Gulf of Cambay Regions have yielded good catch of Eels.

A study of monthly distribution of different groups of fishes shows that for Polynemids, the best season is December to February, for Eels in December, February and March, and Sciaenids appear in good abundance throughout the fishing season.

A comparative study of otter trawling by 'Taiyo Maru 17' and Bull trawling by the cutters shows that although the number of fishing hours for cutters is much less than that for 'Taiyo Maru' the returns are quite high. The catch per hour is nearly 2 to 2½ times of that of 'Taiyo Maru 17'. In most of the months the percentage of good fish is much higher in the catches of the cutters. Among the individual groups of fishes Polynemids and Snappers occupy a good percentage of the Cutter catches and are much higher than in the catches of Taiyo Maru.

Exploratory fishing shows that there are good potentialities for trawling, particularly Bull trawling in the waters off the Bombay and Saurashtra coasts. The yield of fish from Indian waters seems to compare very favourably with that from some of the richest fishing grounds in the European waters, and are even higher than in those regions. However, while European waters have been exploited intensively for a number of years, trawling in Indian waters is now being done on virgin grounds. It is, however, possible to say that there are some really rich grounds off the Saurashtra Coast, particularly in the Dwarka Region.

(ii) Government of India's Deep Sea Fishing Station.

During the quarter ending March, 1957, the exploratory fishing operations of the Government of India Deep Sea Fishing Station are as follows:—

	Period of voyage	No. of days absent from Port	Qty. of fish caught			Catch/day's absence		
Ashok & Pratap (Cochin)			Tons	Cwts.	Lbs.	Tons	Cwts.	Lbs.
	10-1-57 to 22-1-57	13	30	0	48	2	6	21
	27-2-57 to 5-3-57	7	7	0	0	1	0	0
	14-3-57 to 15-3-57	2	2	10	0	1	5	0
	17-3-57 to 18-3-57	2	3	15	0	1	17	56
	19-3-57 to 20-3-57	2	3	16	0	1	18	0
	23-3-57 to 24-3-47	2	2	15	0	1	7	56
	25-3-57 to 26-3-57	2	2	10	0	1	5	0
	27-3-57 to 28-3-57	2	1	17	0	1	8	56
	29-3-57 to 30-3-57	2	2	10	0	1	5	0
M.L'Durga (Cochin)	27-12-56 to 28-3-57	43	21	11	67	0	10	4
M.F.V. Bumili (Bombay)	3-1-57 to 28-3-57	38	6	8	0	0	3	41
M.F.V. Champa (Bombay)	27-12-56 to 28-3-57	56	11	15	35	0	4	23
M. L. Meera (Bombay)	27-12-56 to 28-3-57	70	9	13	92	0	2	54
M. L. Bangada (Bombay)	27-12-56 to 7-3-57	43	21	3	22	0	9	94

The vessels 'Ashok & Partap' left for Cochin on 15th February, 1957 and conducted operations from Cochin from 1st March, 1957.

(iii) New India Fisheries Ltd.

The four vessels of New India Fisheries Ltd. Bombay, continued Bull trawling operations. The landings are as follow:—

Period of voyage	No. of days absent from Port	Quantity of fish caught			Catch/day's absence		
		Tons	Cwts.	Lbs.	Tons	Cwts.	Lbs.
Satpatti & Pilottan							
2-1-57 to 16-1-57 . . .	15	69	0	0	4	12	0
18-1-57 to 1-2-57 . . .	15	71	0	0	4	14	75
3-2-57 to 16-2-57 . . .	14	59	0	0	4	4	32
18-2-57 to 2-3-57 . . .	13	67	0	0	5	3	9
4-3-57 to 15-3-57 . . .	12	59	0	0	4	18	37
17-3-57 to 30-3-57 . . .	14	67	0	0	4	15	80
Arnalla & Paj							
8-1-57 to 23-1-57 . . .	16	72	0	0	4	10	0
25-1-57 to 5-2-57 . . .	12	61	0	0	5	1	75
6-2-57 to 19-2-57 . . .	14	75	0	0	5	7	16
21-2-57 to 5-3-57 . . .	13	82	0	0	6	6	17
7-3-57 to 20-3-57 . . .	14	73	0	0	5	4	32
22-3-57 to 4-4-57 . . .	14	78	0	0	5	11	48

(iv) Deep Sea Fishing Cutter in West Bengal

The analysis of the voyage conducted by Kalyani III, IV and V during the quarter ending 31st March, 1957 is as follows:—

Name of the vessel	Period of voyage	Total Catch			No. of days absent from port	Catch/day's absence from Port		
		Mds.	srs.	chh.		Mds.	srs.	chh.
Kalyani V . .	28-12-56 to 7-1-57	854	0	0	11	77	5	7
„ III . .	7-1-57 to 15-1-57	464	0	0	9	51	22	4
„ IV . .	14-1-57 to 25-1-57	453	0	0	12	37	30	0
„ V . .	19-1-57 to 30-1-57	1010	0	0	12	84	6	11

Name of vessels	Period of voyage	Total Catch			No of days absent from port	Catch/day's absence from port		
Kalyani III . .	29-1-57 to 6-2-57	300	0	0	9	33	13	4
„ IV . .	11-2-57 to 20-2-57	526	0	0	10	52	24	0
„ V . .	20-2-57 to 2-3-57	459	11	4	11	41	30	4
„ III . .	23-2-57 to 7-3-57	419	0	0	13	32	9	3
„ IV . .	6-3-57 to 14-3-57	385	32	4	9	42	34	11
„ V . .	20-3-57 to 31-3-57	465	30	0	12	38	32	8
„ III . .	23-3-57 to 1-4-57	475	19	0	10	47	21	15

(v) The Government of India Quick Freezing and Cold storage plant at Bombay.

During the period 28th December, 1956 to 29th March, 1957 the income realised from (1) sale of ice, (2) hire of cold storage accommodation, (3) basket storage of fresh fish and (4) freezing of fresh fish are as follows:—

	Rs.	As.	P.
1. Sale of ice (638 tons, 12 cwts. and 73·5 lbs.) . .	14,041	6	0
2. Hire of cold storage accommodation . .	14,299	8	0
3. Basket storage of fresh fish	10,638	8	0
4. Freezing of fresh fish	7,377	0	0
TOTAL . .	46,356	6	0

(vi) Progress of the Indo-Norwegian Project for the quarter ending March, 1957.

Training of the sixth and seventh batches of fishermen in handling boats and engines and in the operations of purse seines, harpoons and various types of lines as Troll lines, Anchor lines for bottom fish etc. were continued.

During January and February, 1957, 18 mechanised boats with 3 crew members in each made 873 trips and 940 trips and landed 15,226 lbs. and 57,706 lbs. of fish valued at Rs. 9,311 and Rs. 13,548 giving on an average of Rs. 10/11/- and Rs. 14/6/7 per boat per trip respectively. In comparison, 50 local vallums with 4-5 crew members caught 46,079 lbs. valued at

Rs. 10,466 and 50,891 lbs. at a value of Rs. 11,043/12/- giving an average of Rs. 10/2/7 and Rs. 10/5/2 per vallum per trip respectively. In January the catches per trip amounted to 52 lbs. for mechanised boats and 41 lbs. per vallum.

The three schooners at Cochin continued the exploratory fishing in off-shore waters, mainly trawling and landed 31,883 lbs. in January and February. Three of the 35 ft. boats continued their trawling operations with stern purse seine, and shrimp and fish trawl with good results, one operating off Neendakara, two off Cochin. During 108 hours of actual trawling off Cochin, the catches of two trawlers were 11,500 lbs. of shrimps and 8,000 lbs. of fish at a total value of Rs. 3,338 giving an average of 131 lbs. shrimp and 74 lbs. fish per hour of actual trawling.

In the Boat yard till the end of March, 1957, forty-eight 22 ft. boats were completed and 8 were under construction.

The Ice Factory, the Deep Freezing Plant and the Cold Storage rooms were completed. The Plant was formally inaugurated by Dr. Punjabrao Deshmukh, Union Minister for Agriculture. Ice was being transported to Cochin by the insulated vans to meet the requirements of the Schooners and 35 ft. boats, as well as for marketing of the fish catches.

The Fisheries Programme is now being revised under the direction of Professor G. M. Gerhardsen.

Routine work has been carried out in the Health Section. The Curative Clinic was opened on the 19th January, in Sakthikulangara. Small-pox vaccination has been carried out on a mass scale. 43 new latrines were constructed.

At the Pipe Factory, 348 high pressure pipes and 44 low pressure pipes were produced. The length of the total number of high pressure pipes of 28" diameter now runs to 537 or 1·7 miles.

Conservation & Management

(i) The following proclamations by the President are published for general information.

PROCLAMATION—I

(Dated August 30, 1955)

"Whereas valuable natural resources are known to exist on the sea-bed and in the sub-soil of the Continental Shelf and the utilization of such resources is being made practicable by modern technological progress:

And whereas it is established by international practice that for the purpose of exploring and exploiting such resources in an orderly manner every coastal State has sovereign rights over the sea-bed and sub-soil of the Continental Shelf adjoining its territory;

Now, therefore, I, Rajendra Prasad, President of India, in the sixth year of the Republic do hereby proclaim that India has, and always had, full and exclusive sovereign right over the sea-bed and sub-soil of the Continental Shelf adjoining its territory and beyond its territorial waters."

RAJENDRA PRASAD,
President of India.

PROCLAMATION—2

(Dated March 22, 1956)

"Whereas international laws has always recognised that the sovereignty of a State extends to a belt of sea adjacent to its coast;

And whereas international practice is not uniform as regards the extent of this sea-belt commonly known as the territorial waters of the State, and consequently it is necessary to make a declaration as to the extent of the territorial waters of India;

I, Rajendra Prasad, President of India, in the Seventh Year of the Republic, do hereby proclaim that, notwithstanding any rule of law or practice to the contrary which may have observed in the past in relation to India or any part thereof, the territorial waters of India extend into the sea to a distance of six nautical miles measured from the appropriate base line".

RAJENDRA PRASAD,
President of India.

PROCLAMATION—3

(Dated November 29, 1956).

"Whereas the coastal communities of India have from time immemorial been engaged in fishing activities in the high seas adjacent to its territorial waters;

And whereas certain areas of these high seas provide fisheries which contribute to the food and means of livelihood of large sections of the population and, consequently, India has a special interest in maintaining the productivity of the living resources in all such areas;

Now, therefore, I, Rajendra Prasad, President of India, do hereby proclaim and declare in the Seventh Year of the Republic as follows:

The Government of India may from time to time:

(i) establish, in accordance with laws enacted for the purpose, conservation zones in areas of the high seas adjacent to the territorial waters of India, but within a distance of one hundred nautical miles from the outer limits of those waters;

(ii) take conservation measures in the zones so established in order to protect fisheries and other living resources of the sea from indiscriminate exploitation, depletion or destruction; and

(iii) subject to the provisions of any international agreement or convention to which India, is or may hereafter become, a party regulate all fishing activities in the said areas of the high seas in order to enforce the laws and regulations that may be issued from time to time for the purposes aforesaid."

RAJENDRA PRASAD,
President of India.

PROCLAMATION—4

(Dated December 3, 1956).

Whereas International Law recognises that on the high seas adjacent to its territorial waters, a coastal State may exercise the control necessary to

prevent and punish the infringement within its territory or territorial waters, of its customs, fiscal, immigration and sanitary regulations:

I, Rajendra Prasad, President of India, in the Seventh Year of the Republic, do hereby proclaim that in relation to India or any part thereof such control may be exercised upto a distance of twelve nautical miles from the base line from which the width of the territorial waters is measured."

RAJENDRA PRASAD,
President of India.

MARINE FISHERIES RESEARCH

Annual Progress Report of the Central Marine Fisheries Research Station, Mandapam for the year ending 31st March, 1957

During the year 1956-57, further progress was made in its work on marine fisheries research at the Headquarters Station at Mandapam and at the subordinate establishments at different centres of the country. The Research Units of Bombay and Cochin were upgraded as sub-stations, two new Research Units were opened at Calcutta and Mangalore and 4 additional survey/Research Centres were also set up at Surat, Alleppy, Neendakara and at Pondicherry. The salient features of the report are given below.

During 1956, a substantial increase in the marine fish landings in India was recorded, estimated at 7,07,349 tons as compared to 5,20,000 to 5,86,000 tons during the previous 6 years. While the fishery for the two major groups, the Mackerel and Sardines registered some decline both in Malabar and Kanara Coasts, an almost 50 per cent. increase in the landings of Prawns has been recorded. The Gujarat, Kerala and Madras Coasts were the principal areas where the zonal landings showed substantial increase due to heavier catches of sardines, Anchoviella, and *Engraulis spp.*, *Cybium spp.*, *Caranx spp.*, *Leiognathus* and *Lactarius spp* on Madras Coast, increased catches of *Caranx kurra*, *Prawns*, *Upeneoides spp.* and *Sphyraena spp.*, on the Travancore-Cochin Coast, very successful fishery of *Caranx kurra* on the Malabar Coast and increased landings of non-penaeid prawns and shrimps on Bombay Coast, as against decreased landings in the Andhra and Kanara Coast due to the failure of the fishery of Mackerel and Sardine on the Kanara Coast and failure of *Kowala* and *Caranx* fisheries on Central Andhra Coast.

In most of the zones the variation in the Catch-per-Unit effort is due to variation in the availability of fish during different years. But in Kanara zone, the effort has been increasing from 1954 to 1956, while the catch figures and figures for catch-per-unit effort shows some decline and in Travancore-Cochin the catch and the effort both increased from 1954 to 1956 and the index of catch per man hour shows decline. Both the situations need careful observation in future.

Landings of mechanised fishing vessels belonging to the Government agencies and private enterprise, indicated an almost ten-fold increase from 332 tons in 1955 to 3125 tons in 1956. An important report on the trawling operations between Bombay and Saurashtra has been completed and is under publication by the Ministry.

Fishery biological studies on Mackerel at Mandapam indicated constant changes in "populations" entering the fishery and two distinct spawning periods, one during October-November and the other major spawning during May-June.

Investigations carried on the Hemirhampus fishery which is a very important seasonal fishery in Gulf of Mannar and Palk Bay revealed some interesting observations regarding the systematics, breeding habits and behaviour of these fishes.

Useful information on the fishing industry in general and Tuna fishery in particular have been collected from Minicoy Island for future programmes and fisheries development in this area.

Study on the "Over fishing problems" in the inshore waters of Kozhikode was taken up.

Biological studies on the Pomfret fishery at Bombay indicated that inshore stock of Pomfret has been found to be constituted by juveniles and mature individuals of all the three species and that they have a protracted spawning period and scales of *P. niger* measuring above 20 cm. indicate the presence of 3-4 growth checks whereas Otoliths do not show any such checks.

At Karwar a slight deviation in the programme of Mackerel investigations hitherto carried out here have been made during the 1956-57 season and more emphasis was laid on the collection of intensive data on length frequency distributions and Mackerel landings at some of the important fishing centres like Majali, Karwar, Binage, Chendia, Ankola and Kumta.

At the Prawn Research Unit at Ernakulam, ecological studies on the significance of mud banks on Prawn fishery revealed that the fishery at Alleppy where a mud bank is formed annually is far richer than at Narakkal where no bank exists. The data collected from fishing by the schooners shows the presence of larger Prawns in deeper waters off Cochin. The urgent need for undertaking exploratory fishing in deeper waters to discover the existence of large commercially exploitable concentrations of such Prawns is emphasised.

At the Molluscan Unit at Madras, investigations on clams have been continued. It was possible to conclude that the clams were at their best during January—May. *Meretrx casta* spawned only once a year; the spawning season, start in July lasting for a period of four months.

Investigations on Mackerel fishery at Waltair showed the occurrence of juvenile Mackerel in all the months excepting February, 1957 as compared to during June to September on Malabar and Kanara Coast and April to June off Vizhingam, which suggested the possibility of different population of one or more species with slightly different breeding-seasons. A detailed study on the subject is taken up.

At Calcutta, analysis of catch of the five trawlers of West Bengal Government gave interesting information that although the catch per fishing day from Sand Head region was much lower than that from the Black Pagoda Region, the relative proportion of the first quality fish is higher in the former than in the latter region.

At Vizhingam, important evidence has been collected that spawning season of Mackerel is a much prolonged one extending from July to March and spawning area is outside the present fishing limits by the record for the first time in India of 24·0-27·0 cm. size spawners and large number of 11—22 mm. post larvae from October—June.

Marine biological studies on plankton at Mandapam have showed that a greater abundance of edible planktonic organisms often occur in off shore fishing grounds as against the preponderance of inedible forms in the inshore

area. This factor is suggested as one of the important reasons for the occurrence of large fish populations in off-shore region.

A Plankton Calendar for the waters around Mandapam has been prepared for publication.

Experiments on marine fish farming operations were started at Mandapam and suitable fields at Vaikam in Kerala State have been taken up for extensive field trials on *Tilapia* and Prawns.

Bacteriological studies at Mandapam on the storage of fish in ice and the bacterial flora of fresh and processed fish showed that ice containing 5 p.p.m. of Aureomycin had an advantage over ordinary ice from the 2nd week, onwards during storage. Increase in the iodine titre of the muscle as a test for spoilage appear to be useful.

Survey of the regional curing practices and quality of cured fish of the West Coast was completed. A new chemical test capable of serving as a routine for detection of fish spoilage has been reported.

A new technique of manufacturing quality fish meal by fermentation process particularly suited to non-oil types of fishes like sharks, Rays etc. has been developed. Efforts were also made to put the process on Pilot Plant scale and a small fish meal plant capable of handling 100 pounds of fish at a time was designed and constructed.

A new method has been worked out for the preparation of pure alginic acid from Sargassum Sea weeds and commercially important salts of the acid such as sodium alginate, calcium alginate, copper alginate etc. have been prepared which seems to offer commercial possibilities.

Economy was effected in the Cottage Industry method of preparing agar for food and general purposes by introducing coagulatin with potassium biphosphate of proteins. Investigations have shown that bacteriological agar may be prepared entirely as a Cottage Industry by the process of prolonged bleaching where cold storage facilities are not available. Studies on the genus *Hypnea* of the Indian waters, particularly its taxonomy and distribution are in progress.

(Central Marine Fisheries Research Station, Mandapam Camp).

Fishery Biology

(i) **A preliminary study of the pelagic fish eggs and larvae of the Gulf of Mannar and the Palk Bay.**

The present paper reports on the occurrence, distribution and fluctuation of pelagic fish eggs in the Gulf of Mannar, and the Palk Bay near Mandapam. Results are based on the examination of 43,352 fish eggs from 238 samples of plankton collected from the Gulf of Mannar and the Palk Bay. The eggs from each sample were separated into lots, viz. A, B, C, D, E, F, G, H, I, K, L, N and S according to the size of the egg capsule, nature of yolk, oil globules, pigmentation etc. There are seasonal variations in the abundance of fish eggs. It has been observed that there is a greater concentration of fish eggs in the Gulf of Mannar than in the Palk Bay, although the general trend in their occurrence was similar in both the areas. Eggs are taken in maximum number in the month of March, when the surface salinity temperature in the Gulf of Mannar and the surface temperature in the Palk Bay were fairly low.

Of the fourteen types of eggs and larvae, six belong to the suborder Clupeoidae; two to genus *Caranx*, one to *Cynoglossus*, and one to family

Muraenidea.. Eight types have been tentatively identified upto the genus or species, namely, *Anchoviella* sp., *Thrissocles* sp., *Kowala* coval, *Dussumieria* sp., *Sardinella fimbriata, Caranx leptolepis, Caranx* sp., and *Cynoglossus* sp. Spawning appears to take place in types B, D, H, C and I late in the evening or early in the night and in E in the early hours of the day. The maximum spawning takes place during the low salinity-temperature period which suggests that these factors may considerably influence spawning. The presence of majority of the types of eggs in varying numbers during a greater part of the year indicates a protracted breeding season in many species.

The Clupeid eggs were encountered mostly in the waters of the Gulf of Mannar, the waters of the Palk Bay being very poor in them. They were taken in large numbers in the month of March. The trend in the occurrence of Carangids eggs in both the areas was similar throughout the year, although the eggs were found in greater abundance in the Gulf of Mannar. They showed two peaks in their distribution, the primary peak falling in March and the secondary one sometime during September-November.

(S.V. Bapat. Indian Journal of Fisheries, Vol. II, No. I, April, 1955).

(ii) **Studies on the fishery and biology of the Malabar Sole, Cynoglossus semifasciatus Day.**

This paper comprises the studies on various aspects of the biology of *C. semifasciatus* at West Hill, Calicut, during the period April, 1949 to March 1952. The fishery for soles is important only along the Malabar coast although this fish occur in some quantities along the adjoining coast of South Kanara as well. This is the only flat fish which occurs in large shoals. The best season for the fishery is immediately after the South-West monsoon. September being always the month of peak commercial catches. The species has, however, been known to occur in shoals from August of one year to February of the following year. Soles are inexpensive fish. There has been a remarkable increase in the catches during the post-war years followed by a decline in 1951-52.

The food of *C. semifasciatus* consists of bottom organisms except during the period immediately following the cessation of the south-west monsoon, when the species occur at all levels in shoals and feeds also on planktonic stages of polychaetes dominated by *P. pinnata*. This is the most favoured single species in the diet of Malabar soles. The polychaetes, as a group, rank first among food items, the amphipods and lamellibranchs coming second and third in order. No starvation is indicated in the spawning season. The food factor appears to be important in determining the inshore migration of the fish immediately following the cessation of the monsoon.

The following relationships are found between the standard length Y and the total length X:— (1) Y-0·91 X-0·09 (2) X-1·09Y — 0·13. Findings on age and growth show that the rings in the scales of Malabar sole, are regular annuli indicating the age of fish and that they are formed under the influence of the south-west monsoon. The scales of *C. semifasciatus* is ctenoid and shows variations in form in different regions of the body.

The sexes are recognisable in the Malabar sole of 6 to 7 cm. total length. The analyses of the states of maturity of ovaries show that majority of females are in an advanced stage of maturity. (Stage IV or V) during the usual commercial fishery months (September and October). The post monsoon inshore shoaling of the species is soon followed by a spawning migration to deeper waters. Spawning comments in October and continues till May. Juvenile

individuals start appearing in the inshore collections from December onwards, but sometimes from November. The off-springs from October-May spawning grow up to commercial size and form the bulk of the commercial fishery during September-October season immediately following. The older individuals are very few in these months, thus showing that the fishery is essentially of an "annual" nature. Symmetrical post-larvae were collected in April 1952 and metamorphosis was observed. Various stages of metamorphosis are described.

The indications are that the decline in sole fishery noticed during 1951-52 and 1952-53 along the coast in general and in the West Hill Sea in particular is due to unrestricted fishing as evidenced by the magnitude of catches breaking all previous records. For the West Hill Sea the evidence is marked that there has been too high a capture of would-be-spawners and juveniles during the years immediately preceding the present decline.

It is also suggested that juvenile stocks should be protected against exploitation, to quicken the pace of recovery of the fishery.

(Seshappa, G. and Bhimachar, B.S.—Indian Journal of Fisheries, Vol. II. No. I April, 1955).

INLAND FISHERIES RESEARCH

Progress of Research work done at Central Inland Fisheries Research Station, Calcutta for the year 1956-57.

During the year considerable expansion and intensification of the research programmes was carried out. Tilapia Investigation Unit, Paddy-cum-fish culture unit, Weed control unit and Water pollution Unit were started. Culture of brackish water fishes was initiated. Investigations on fisheries of River Ganga were undertaken.

Technical assistance was given by Pond Culture Section to Fisheries staff of Andhra State regarding fry collection, rearing, manuring, eradication of predatory insects, transport and stocking, artificial feeding of fry etc.

During the year 6615450 fry 16 kunkas of spawn and 133200 fingerlings of carps were despatched by rail and 2100680 fry by air to various States in India and to Nepal, Penang and Malacca. Fisheries Extension Unit at Calcutta gave technical advice to several fish farmers in West Bengal and neighbouring States for improving fish culture.

33 candidates (18 Government deputees, 9 Govt. stipendaries and 6 private candidates) from various States were given training. A refresher course was held for Fisheries Extension Workers and Officers. 4 Officers from Philippines and one from Ceylon also received training.

Research work continued in all the three sections—Pond culture, Riverine and Lacustrine, and Estuarine at Cuttack, Allahabad and Calcutta respectively.

Pond Culture Section

Fish culture experiments were conducted at Killa and Zobra farms at Cuttack, Linghipur fish farm at Bhubneshwar, the Brick field fish Farm at Puri and at the new farm at Chaudwar. Investigations on natural food of Tilapia indicated (a) fry of 7-10 mm. long feed entirely on zooplankton, with rare algal items (b) from 11 mm. to 60 mm. fish feed equally on zoo and phyto-plankton, (c) from above 60 mm. the main food is phytoplankton.

Remarkable feature is that sand or mud in appreciable quantities is rarely met among gut contents of Tilapia. The role of Tilapia in carp ponds has been initiated. Experiment on paddy-cum-fish culture was undertaken in the Central Rice Research Institute fields which is to be completed in April, 1957.

18 tanks in Orissa and 8 tanks in Madhya Pradesh were surveyed with a view to study correlation between soil composition and fish production. Studies on the soil and water quality of reclaimed swamps indicate that for fairly productive swamps soil reaction is slightly acidic with pH 6·6 to 6·9. The available nitrogen and phosphorous ranged from 16·4 to 30·8 and 5·0 to 8·0 respectively.

Survey of common aquatic weeds has been initiated in Orissa State. The experiments on the use of a mixture of Copper sulphate and Ammonium sulphate applied as soil sterilants for controlling submerged weeds are in progress. Sodium arsenite at 5 pp.m. was very effective against submerged weeds without any adverse effect on fish.

Fry rearing work indicated that while soil is almost purely sandy or with a slight mixture of clay, the water acidic to slightly alkaline and nutrients and total alkalinity low, it is possible that the fry are incapable of adjusting and assimilating the available plankton fully.

The effect of super-phosphate, and a mixture of Copper sulphate and Ammonium sulphate were conducted in regard to pond fertilisation and weed control.

Experiments conducted on the clearing of ponds of unwanted fish and insects by the application of oil cakes, Folidol, Sweet flag (*Acorus calamus*) extract etc. have not been encouraging.

Among the three Organochlor insecticides—Aldrin, Dieldrin, and Endrin—the Endrin has been found to be most effective and can be used for the eradication of fishes, insects, prawns etc. Aldrin is the least effective of the three. Further work is in progress.

It has been proved that there is a definite increase in the yield of organic matter as the total alkalinity of water increases. Experiments on rearing advanced fry to fingerlings stage were abandoned due to floods. Experiments in transport of spawn and fingerlings showed that plastic bag and tin container were equally efficient.

Experiments in breeding by hormone injection were tried in *Pseudentropius atherinoides, Rohtee cotio,* and *Perilampus* sp.

Experiments on fish production in stocking ponds are in progress. Food and fecundity studies of the minnow *Esomus danricus* and the systematics and bionomics of some of the important predatory aquatic insects were made. Detailed studies on planktonic Rotifers, Copepods, and Cladocerans were continued. A systematic study of the natural history of a small fresh water prawn *Palaemon lamarrei* has been initiated.

Riverine & Lacustrine Section

Fisheries at Buxar on the Ganga river showed that Hilsa was predominant (50·8 per cent.) with size ranging from 14 in. to 18 in. and the maximum quantities were landed from October to January. Catch peaks of Hilsa at Buxar and Allahabad are separated by about 20 days interval. The major carps made up 15 per cent. of the total annual catches at Buxar with *C. mrigala* the most predominant species. Cat fish fishery made up over 22 per cent of the total annual catches. The fisheries of *Mystus* spp. and *Wallago* were most important.

At Sadhiapur, Allahabad a total of about 12900 mds. of fish were landed as against 8960 mds. in 1955-56. Hilsa formed 63·5 per cent with size ranging from 15 in. to 18 in. and with greatest abundance from October to December. Major carps contributed 14·9 per cent. of the catch with *C. mrigala* as the predominant species. Fishery of Hilsa, mrigal, *Mystus* and *Wallago* formed 83 per cent. of the total catches. Among cat fishes, Mystus & Wallago were predominant. Data were collected to calculate the catch per unit of effort of fishermen in the vicinity of Allahabad. A survey of fishing villages located along the banks of river Ganges, Jumna and Tons in the district of Allahabad has been completed. Investigations on the availability of major carp seed in Western districts of U.P. were carried out. The fishery biology of several commercial species, e.g. *C. mrigala, Mystus* spp. *Labeo calbasu* and *Pangasius pangasius* was studied. It has now been established that the Mrigal scales are reliable indices of the age of fish.

With a view to assessing the fishery resources of the Ganga system and determining the status of different fisheries, a scheme for survey of the Ganga river has been initiated. A stretch of about 250 miles in Uttar Pradesh from Siyana (Bulandshahr district) to Baksar (Unnao district) has been surveyed.

Estuarine Section

Studies on the fisheries and fish populations of Hooghly and Matlah estuaries were carried on. There were very poor fishing conditions in Hooghly and Matlah estuaries. Samples of commercial catches were studied for the study of age or size class composition, maturity and feeding intensity of fish stocks. Hydrobiological observations of the two estuaries were conducted to examine the correlation between the fluctuations in the abundance of fish stocks in the estuary and the density of plankton in them.

Investigations on population structure, length frequency studies, maturity and feeding and of earlier stages of Hilsa were initiated in the Hilsa Investigation Unit established at the close of October, 1956. Hilsa in the river Ganga and river Karmanasa, a tributary of the Ganga, river Godavri and Hooghly and in river Brahmaputura and Barak rivers belong to separate racial stocks. Winter fishery for Hilsa in Sunderbans was a complete failure. The techniques of collection and assessment of larvae of Young ones of Hilsa are under experimentation.

Studies on the productive potential of brackish water bheris indicate that shallow waters produce larger quantities of algae especially Myxophyceae Ruppia-thrives in deep waters. Pot culture experiments to study the requirements for the growth and multiplication of benthic algae showed that a salinity between 10 per cent. and 15 per cent. is most suitable for the growth and multiplication of algae. Low temperatures below 28°C is not conductive to the growth of alga. Culture of brackishwater fishes in paddy fields show that the species grow faster in paddy fields than in the open estuaries.

Chilka Investigation Unit is engaged in recording the fishing grounds of the lake, biology of the lake fishes and hydrobiology of the lake. Considerable progress has been made in studies on the maturity of the important fishes of the lake and compilation of fish export statistics from Chilka area. For the purpose of fishery survey, the lake has been divided into four sectors. The Jano fishery or of enclosure traps in the Chilka lake area was successful. Studies were commenced with 11 commercially important species of fish to determine whether the fishes of lake breed in the lake or outside and the exact extent of their breeding seasons.

The Lacustrine Unit established in August 1956, has initiated the work of collection of preliminary information on the lacustrine fishery resources and selecting lakes and reservoirs for detailed investigations.

(Central Inland Fisheries Research Station, Calcutta).

Fishery Biology

(1) On the role of Zooplankton in the nutrition of the Carp fry.

Experiments were carried out to find out the density of zooplankton required for the optimum survival of fry on field and aquaria over a period of two years.

(1) The volume of zooplankton in C.C. available per fry at the time of stocking and the predominant genus (2) Minimum volume of zooplankton in C.C. available for fry during the entire period of rearing (3) Number of days when minimum plankton occurred (4) percentage of survival and other special observations were recorded in field tanks. In Jagatsinghpur tanks, dry in summer, the maximum survival of 93·9 per cent. occurred when 0.1 C.C. of zooplankton, consisting mainly of cyclops, was available, per fry at the time of stocking and this concentration of 9·1 C.C. per fry was maintained throughout. In Chowdar tanks with water in summer, the maximum survival of 76·6 per cent. occurred with an initial availability of 1·32 C.C. of food per fry, mainly consisting of Cladocerans, the minimum concentration at any time being 0·33. A concentration of 0·12 in the beginning and a minimum of 0·033 C.C. per fry, during the rearing period, gave a yield of 65 per cent. in spite of a *Microcystis* bloom before stocking which continued for two weeks. It is probably that where sufficient zooplankton is available, the blooms have less adverse effect. In the tanks of different blocks, with water in summer, the maximum survival of 78·2 per cent. was obtained with an initial availability of 0·4 C.C. of food per fry, mainly *Brachionus*, the minimum concentration being 0·017. Volvox, Microcystis and *Eudrina* blooms occurred in tanks at a stage when the zooplankton was at a minimum and these seem to have had an adverse effect on survival. Dry tanks in summer in Hindol did not have any phytoplankton blooms at any time. The results were generally poor. In the tanks with blooms of *Volvox*, the percentage survival was only 13, concentration of zooplankton was fair but later insufficient quantity of zooplankton, combined with the thick growth of algae had deterimental effect on survival of fry. In other tanks filamentous algae predominated, especially *Spirogyra* which is less detrimental to fry, survival being 30·1 per cent. and 92·9 per cent. and the minimum availability of plankton was 0·005 and 0·007 C.C. per fry.

In aquaria experiments quantity of food available per fry; percentage of survival in zooplankton, percentage of survival in phytoplankton, percentage of survival in oil cake and percentage of survival in cowdung were recorded. Best results have been obtained with oil cake upto an availability of 0·016 C.C. per fry and next in order come zooplankton, phytoplankton, and cowdung. Increasing quantity of phytoplankton has decreased the percentage of survival, which is also the case with cowdung. On the other hand, increasing quantity of zooplankton has yielded progressively better results. It is interesting to note that a higher availability of oil cake than 0·016 C.C. per fry led to poorer results, presumably on account of its putrefaction in water. Correspondingly 0·02 C.C. of zooplankton per fry did not give as much survival as in the case of 0·016 C.C. of oil cake. The optimum results have been achieved by a concentration ranging from 0·1 C.C. upwards. Oil cake, being concentrated feed,

naturally gave more nutrient, volume for volume, as compared to zooplankton. It is seen that with an availability of plankton from 0·1 to 0·3 C.C. per fry, 45·5 per cent. is the survival and a higher concentration of plankton does not give correspondingly higher level, while a lower concentration of 0:01—0:1 C.C. per fry gives a low rate of survival of only 32·8 per cent. From tanks where predators were eliminated to a great extent; a higher concentration of plankton than 0·33 C.C. gives 10 per cent. more survival than a concentration of 0·1—0·3 C.C. less than 0·1 C.C. availability of zooplankton per fry gives much poorer results. It is concluded that zooplankton consisting of minute organisms, is essential for the proper nutrition of Carp fry. An initial availability of zooplankton, 0·1 to 0·3 C.C. per fry, yields optimum results under field conditions, and a higher concentration than this does not show appreciably better results. Occurrence of phytoplankton blooms produces detrimental results, especially when the zooplankton is poor and the phytoplankton blooms occur for long periods. In field conditions, the quantity of zooplankton required per fry is nearly ten times what is needed in the aquarium, to give comparable yields.

(Mitra, G.N. and Mohapatra, P.—Indian Journal of Fisheries, Vol. III, No. 2, October, 1956).

FOREIGN

GENERAL & DEVELOPMENT

Marine

(i) Taiwan (Formosa)

Fish catch in 1955 *broke all previous records.*—The 1955 fish production in Taiwan reached 180,618 metric tons. This broke all previous records and exceeded the target set in the Four-Year Production Plan by 20,618 tons. (The target for 1955 was 160,000 tons).

Mechanisation of small fishing craft.—With the installation of diesel engines on 69 "sampans" under the assistance of JCRR (Joint Commission on Rural Reconstruction) loan in 1954, as a start, the mechanization program gained momentum in 1955. As of the end of September, 1955, a total of 463 sampans had been equipped with diesel engines of 4 to 6 hp. This number included 151 sampans mechanized with JCRR assistance, but does not include 20 bamboo rafts which were equipped with 2 hp. diesel engines under a JCRR demonstration project.

(Commercial Fisheries Review, Vol. 18, No. 3, p. 51, March, 1956).

(ii) Shrimp Fisheries—Thailand

The Thai Shrimp fishery at present is confined to shore and estuaries of the Gulf of Siam and to lagoons bordering the Gulf. One recently started Japanese-type bull-trawl operation catches shrimp in offshore areas of the Gulf; this operation being incidental to other types of fishing.

While shimp fishing is scattered extensively throughout the Coast, principal fishing areas at present are: (a) off the mouth of the Menam Chao Phya; and (b) at Songkhla within the Inland sea (Thale Luang) and its outlet to the Gulf.

The Chao Phya fishery is conducted during the dry season—February to June or July by approximately 100 small boats of no regular type (sampans

and other small crafts many of which are powered by semi-Diesel or Diesel engines). Each of these boats employ one or two small locally made beam trawls.

The Songkhla fishing is carried on throughout the year by cast nets, beach seining, and traps. No trawls are used.

There are no canneries engaged in packing shrimp, but shrimp drying and shrimp-paste manufacture is important and very widespread. Although freezer space is available, no shrimp are frozen and there is no commerce in this product. Shrimp-flavored chips. (Krupoek) are manufactured in considerable quantity for local use.

It is believed that the total catch (all types of shrimp for all purposes) is at least 44 million pounds annually with production definitely increasing.

Many species make up the commercial catches. For shrimp paste, very small types (*Acetes* sp.) almost planktonic in size are used. The largest shrimp a *Peneid* type runs 4 or 5 per pound heads on. In between are other specie. of varying sizes.

Fresh or iced shipments are very small and are made only occassionally to Malaya from areas near that territory. No frozen shrimp and no canned shrimp is produced or exported. Exports of dried shrimps are made to neighbouring countries and to Hongkong. The quantity of such exports being estimated at 1·1 million pounds a year. There are probably small exports of shrimp paste (Kapi) to countries bordering on Thailand.

(Commerical Fisheries Review, Vol. 18, No. 1, p. 61, January, 1956).

(iii) New Oyster Culture

A new floating lunch counter' method with oyster seeds planted on shells suspended from a raft, instead of old system where the seed is planted in rows or strewn over oyster bed; has been evolved to double the production.

Because the oysters are in the water 24 hours a day and not subject to tides, they are able to feed continuously, with the result that growth is twice as fast.

(Canadian Fisherman, Vol. 43, No. 2, p. 27, February, 1956).

(iv) Jap' Tuna catches in Indian Ocean

Japanese tuna long-line fishermen are getting catches of 12-14 yellow fin per 100 hooks in the Western Indian Ocean. This is much higher catch rate than they get on any other grounds.

The 750-tons Seiju Maru returned to Shimigu (Japan) with a full load on 425 tons of tuna after an 80-day trip that extended across the Indian Ocean to the vicinity of the African Coast. The average day's catch was 12 tons of yellow fin. It was expected that the proceeds of the voyage would amount to £40,000 and the crew members would each receive about £122.

(Fisheries News letter, Vol. 15, No. 3, March, 1956).

(v) U.S. Fish stick production

The production of fish sticks in 1955, exceeded 65 million pounds, compared with almost 50 million pounds in 1954, and 7·5 million pounds in 1953. In 1952, the only production was in pilot plants engaged in getting this new industry started. Production is still centered in New England (which accounts

for about 40 million pounds of the total), but the industry has spread to many states on the eastern and western seaboards and even into the Midwest.

During 1955, 88 per cent. of the production was made up of cooked fish sticks and the remaining 12 per cent. was uncooked.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 33, February 1956).

(vi). Green Crab menace

The Fisheries Research Board of Canada has declared war on an invader—the green crab which has been moving north along the Atlantic Coast. The green crab is one of the clam's worst enemies. Wherever it has appeared, it has attacked stocks of young clams which are its favourite food. It multiplies rapidly.

Clam fishermen and others, particularly in south-western Nova Scotia, are now watching out for the green crab, and their reports to the St. Andrews Station of its presence are the first move in this tidal-zone war.

(Canadian fisherman, Vol. 43, No. 2, p. 4, February, 1956).

(vii) Bread from fish

Canadians of the future might well be eating bread made of fish Small amounts of fish protein have already been mixed with flour laboratory tests to obtain loaves of good appearance and taste.

Atlantic Fisheries Experimental Station had manufactured from fish flesh a protein, which is white, odorless and tasteless. A sample was kept exposed to light and air for six weeks without any change in taste or color.

Bread, baked with flour containing 10 to 20 per cent. of its weight of the fish protein, had an agreeable odor, it was reported. Assessment of the economics involved in the production of edible proteins awaits pilot plant assays.

(Canadian Fisherman, Vol. 43, No. 2, p. 10, February, 1956).

(viii) UNKRA helps fishing industry in 1955—Republic of Korea

Included among numerous operations undertaken in the Republic of Korea in 1955 by the United Nations Korean Reconstruction Agency were loans and UNKRA imported materials and engines for the construction of fishing boats. Fishing boats (1-25 tons) completed in 1955 numbered 208. At the end of the year 12 boats were under construction and enough humber and engines were on hand to build up to 200 more vessels and repair about 500 others.

In addition to the construction of fishing vessels UNKRA aided in rehabilitating and modernising three canneries. One in Pusan was reported to have tripled its production with the aid of UNKRA—imported machinery.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 47, February, 1956).

(ix). New Factory trawler starts fishing

The new Norwegian factory ship *Havkvern* (the first of its type) departed on its first trip to the North Sea for herring in early December, 1955. The 165-foot vessel was built in Germany and has a reduction capacity of 50 tons of raw herring per 24 hours. This new experimental ship will operate both

as a trawler and a floating reduction plant for fish meal and fish oil and production will be sold in England.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 50, February, 1956).

(x) Australian Shrimp Fishery

The Australian shrimp fishery is relatively small and the fishing grounds are scattered over wide areas. The catch is used almost entirely for the local market. Total production of shrimp during the period July 1, 1954, to June 30, 1955, was 6·6 million pounds; valued at ex-vessel at about U.S. $ 2 million. The production for 1953-54, was 4·3 million pounds and for 1952-53 3·3 million pounds.

Shrimp exports are understood to be insignificant; small quantities have gone to Newzealand and various Pacific Islands, and recently samples were sent to the United States and to the United Kingdom.

The shrimp fisheries in Australia are chiefly confined to waters along the north coast of New South wales and Southern Queensland, although a few are found on the coasts of southern New South Wales and Victoria. The ocean fishery is still in its early stages of development, but estuarine shrimping, by small boats, has been carried on for many years taking mainly "greasy-back" and "school" shrimp. The shrimp season is principally from June to September. Shrimp fishing is done almost entirely by individual boat owners who have formed themselves into cooperation for the purpose of packing and marketing their product.

There are no shrimp canneries in Australia, but the fishermen's cooperative have facilities for freezing shrimp and, in addition, the Queensland Fish Board has freezing equipment. Otter-trawl is used and fishing is done in inshore waters at depths of less than 30 fathoms.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 44, February, 1956).

(xi) Fish cookery program for 1956

An estimated 200 fish cookery demonstrations, most of them for school-lunch groups, will be given by the Fish and Wildlife Service during 1956. At present 180 demonstrations have been scheduled or are in the process of being scheduled.

In 1956, the project will be expanded to provide for a nation-wide program. In some of the States in which demonstrations were given five or more years ago, additional series are now being scheduled to train persons who have entered the school-lunch program recently.

To date, the following demonstrations have been scheduled, with others to follow. Texas 50 demonstrations, California 48; Maryland 10: Missouri 12, Wisconsin 12; Virginia 25; and South Carolina 23.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 29, February, 1956).

(xii) Mechanised clam digging

The trend towards automation has now reached the clam flats of the Maritime provinces. A mechanised clam digger has been developed which may eventually eliminate, or reduce to a large extent, the back breaking work which has been the traditional lot of the clam digger. However, labour saving is not the reason for developing the mechanised digger: Hand digging has

been shown to be very destructive of young clams on the beach and it is hoped that the power digger will reduce destruction and allow culture methods.

So far only one such machine has been built in Canada. Results so far have been encouraging. In tests at Clam Harbour in Halifax country, Nova Scotia, it harvested clams to a depth of 14 inches from 1,200 square feet of bottom in one hour. It is 90 per cent. efficient in harvesting small clams from half an inch to an inch long from the upper six inches of the soil and 50 per cent. efficient in taking larger sizes. In its present form the digger can be useful on high flats where there are plenty of young clams but where growing conditions are poor. The young clams can be transplanted to better growing areas. Last summer over three-quarters of a million young clams were harvested and transplanted to beds where they can be studied so that the advantage of transplantation can be measured.

The mechanical digger is a scoop equipped in front with water jets. It is pushed through the soil by a shallow-draft boat. Clams loosened from the bottom by the jets enter the scoop and are carried up to the boat by an endless belt conveyer. The St. Andrews Station is continuing its experiments, modifying the design of the digger to improve its efficiency in taking larger clams.

(Canadian Fisherman, Vol. 43, No. 2, p. 6, February, 1956).

(xiii) West Coast shrimp fishery good—Mexico

Following several years of declining catches, the 1955-56, shrimp fishery on the west coast of Mexico is very good. Freezing plants are working at capacity and the boats dock alongside the wharf 4-6 days, waiting to unload catches of 5-8 tons per boat. In the Mazatlan area some of the freezing plants unable to freeze the catches, re-ice their boats and send them out again for several more days. The boats have been returning with an additional ton or two of shrimp picked up practically outside the harbour.

At the present time there are 14 freezing and packing plants operating in the Nogales area. The only shortage in the shrimp industry of the Nogales area is enough labour to operate the plants. The companies are sending out agents to bring girls from the farms and outlying villages to supplement the local labour.

The prices of the shrimp delivered to United States whole-salers have remained fairly steady. Small sizes (upto 50 count per head) were bringing 43 U.S. cents a pound; the extra large sizes (10-15 count) were bringing upto 85 U.S. cents a pound. The official shrimp closed season in 1956, will be from March, 15 to April, 15, instead of the usual July, 15, to August, 15.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 47, February, 1956).

Inland

(i) Great Slave Lake

The 1955, summer production of all the species from Great Slave Lake was the largest yet recorded. The total production of whitefish, trout, inconnu, pike and pickerel amounted to 4,845,323 pounds, round weight, as compared with the 1954, summer production of 4,141,193 pounds. There was a substantial increase in the number of fishermen and boats operating on the lake.

(Trade News, Vol. 8, No. 9, p. 10, March, 1956).

(ii) Great Lakes Fishery Commission

The commission held its organisational meeting in Ottawa, April, 23-25. The committee recommended that the lamprey control network should be completed on lake superior this year, with 10 to 20 new barrier on the Canadian side and six on the United States side. The commission would build 55 barriers in 1956, on Lake Michigan. It is estimated that construction of electrical barriers on all lamprey spawning streams flowing into all the Great Lakes should be completed by the end of 1960.

The committee also recommended the continuation of tagging programmes to delineate fish populations in the Great Lakes, and the studies to find ways of utilizing the fishery potentials to the best advantage, in both Canada and the United States.

(Trade News, Vol. 8, No. 10, p. 17, April, 1956).

Technology

(i) Preparation of mullet roe

Dried mullet roe is prepared to a limited extent along the south-eastern coast of the United States, from North Carolina to Florida. The unbroken roe bags are placed in tubs where they are either sprinkled with salt or soaked in strong brine. About 5 quarts of salt are added to each 100 pounds of roe. Too much salt will cause the egg sacks to break. After the roes have remained in the brine for 10 to 12 hours, they are drained and spread on boards in the sun to dry. They are taken in each night to prevent their becoming wet by dew. During fair weather the drying process requires about a week. The finished product varies in colour from a yellowish brown to dark red.

When the drying process is completed, the roe may be dipped in a mixture of melted beeswax and paraffin and held for a considerable period of time at room temperature. It can be kept for much longer periods under refrigeration at 40° to 50° F.

The mixture of 50 per cent. wax and 50 per cent. paraffin prevents further loss of moisture in the preserved roe. In some cases this product has been smoked with a cool smoke immediately after brining. Only a very light smoke is used for approximately 30 minutes at just sufficient heat to burn the saw dust. This adds to the keeping quality and flavour of the final product.

(Commercial Fisheries Review, Vol. 18, No. 2, p. 17, February, 1956).

(ii) Refrigerated sea water

Small scale experiments on the transportation and storage of fish in refrigerated sea water has proved so successful that a large scale test has been planned, according to the Pacific Fisheries Experimental station at Vancouver.

Three tanks were fitted into a 60-foot fish packing vessel for the experiments last year. The vessel had a capacity of about 40,000 pounds of fish. The sea water was circulated through the tanks by centrifugal pumps and maintained at a temperature of 30° F.

The quality of the fish kept in tanks was excellent with appearance and firmness usually good. The system for commercial fishing offers considerable improvement in quality of fish landed in comparison with normal handling procedures. Crushing is practically eliminated and loading and unloading are simplified.

Plans are now underway in cooperation with the Industrial Development Service of the Department of Fisheries to extend the investigation to a halibut vessel having a capacity of 110,000 pounds of fish.

(Canadian Fisherman, Vol. 43, No. 2, p. 14, February, 1956).

(iii) New 'Super' fish meal

A "Super fish meal" from the viscera of cod and haddock may soon come into commercial production. Research on the use of the meal is being carried out by the Dominion Experimental farm at Nappan, N.S.

The new type of fish meal, according to the Atlantic Fisheries Experimental Station, can be made from the fish viscera which is thrown over board in appalling quantities each year by the fishermen. It is estimated that at least 300 tons of viscera are dumped back into the sea by one trawler. This can make 60 tons of the new dry visceral meal.

The process of converting the viscera from cod and haddock into meal is a simple one. The viscera is placed into large tanks aboard the fishing boat, a preservative is added, and fermentation is allowed to take place for several days. At the end of this time the viscera is completely liquified. The moisture is then evaporated by drum drying and the result is a cream-colored meal, very palatable and rich in vitamin content.

(Canadian Fisherman, Vol. 43, No. 3, p. 29, March, 1956).

Trade

(i) Shrimp catch and exports, 1952-54—Japan

In the years 1952–54 the Japanese catch of shrimp averaged close to 100 million pounds annually. Most of the catch is consumed in Japan, but some frozen, canned, and dried shrimp are exported. The United States' share of the frozen shrimp exports was about 89·4 per cent of the 273,000 pounds exported in 1953 and 92·8 per cent of the 291,000 pounds exported in 1954.

The shrimp catch is made up of three predominant species: "kuruma-ebi" (*Penaeus japanicus*) "Kuma-ebi", (*Penaeus semisulcatus*), both averaging about 5 shrimp to the pound; and "shibiebi" (*Penaeus joyni*) averaging about 40 shrimp to the pound. (Presumably heads—on in all cases).

The principal shrimp fishing areas in Japan are Uchiwra Bay, Bakkaids; the waters of the North-eastern Hokkaido; the Inland Sea; Osaka Bay, Ise Bay; and Ariake Bay, Kyushu. The fishing season is from June through September. About 90 per cent of the catch is made by small 15–20 ton trawlers using trawl nets. The remainder of the catch is taken by miscellaneous boats using a number of types of gear. Most of the vessels catching shrimp, especially the trawlers. do not catch shrimp exclusively, but take all types of fish, among which shrimp average about half the catch during the shrimp season.

There are no known freezing plants or canneries which operate exclusively for shrimp; during the shrimp season the plants which handle other types of marine products or canned goods simply take on shrimp as an additional line.

Commerical Fisheries Review, Vol. 18, No. 3, p. 42, March, 1956).

Conservation & Management

(i) Proposal to abolish prawn legal length

The scientific investigation of prawn stocks in the adjacent waters of New South Wales (Australia) has shown that the migration of prawns from the Ocean into the estuaries is not necessary biologically, and that only a small portion of the main stock in ocean waters comes into the estuaries, especially the large coastal lagoons with their small shallow entrances. The fact that the estuarine catch remains constant, despite the development of ocean prawning, supports this conclusion.

There would, therefore, seem to be no objection, from a fishery management point of view to the catching of the majority of prawns in the estuaries, irrespective of their size, except in areas, where they are an important food for ground fish, due to scarcity of other suitable food. The existing conservation laws enforced by the Department were designed when the presence of prawn stocks in ocean waters was not known, and the authorities held the opinion that unless a sufficient quantity of prawns frequenting the estuaries were allowed to escape to sea on their spawning migration, there would be no prawns to re-stock the estuaries next season.

Like most theories following marine research, only by experimenting could the results of the removal of the legal size protection on prawns be accurately assessed.

(Harris, N. V., Fisheries Newsletter, Vol. 15, No. 3, March, 1956).

(ii) To plant white fish in Lake Ontario

Approximately 40,000 yearling white fish are scheduled to be planted in Lake Ontario in 1957. A planting of 20,000 marked fingerling lake trout off Main Duck Island was done in co-operation with New York State, by Canada, as a contribution to the lake trout rehabilitation project under way in Lake Ontario.

(National Fisherman, Vol. 37, No. 1, p. 29, February 1956)

(iii) Canada demands Pink Salmon treaty

In view of the improved position of Canadian fishermen last year in the pink salmon fishery of the Juan de Fuca Strait area of B.C., it is understood that renewed demands have been made for a treaty between Canada and United States. Last year Canada's share of the catch was 43·4 per cent. as compared with 32·9 per cent in 1951.

The case of pink salmon is slightly different from sockeye regulated under the International Pacific Salmon Commission. The sockeye treaty was to regulate the catch on a 50-50 basis of a species which spawned in Canadian waters—the Fraser. It is understood that some of the pink salmon which end up in the nets of B.C. fishermen spawn originally in Puget Sound American waters.

Which body would regulate a pink salmon treaty is also another problem which would have to be solved. With the take of Canadian fishermen in 1955 being one of the biggest in history, it might also be asked if a 50 percent quota would not be setting too low a ceiling on what could be caught.

(Canadian fisherman, Vol. 43, No. 3, p. 2, March 1956).

MARINE FISHERIES RESEARCH

Fishery Biology

(i) The bacterial flora of fresh fish and its technological implications.

The classification of the bacterial flora is in a state of flux. Formerly Achromobacter, Flavobacterium, Micrococcus, and Pseudomonas were generally believed responsible for causing fish spoilage; however, recent studies have indicated that Corynebacterium and Mycoplana also probably occur on fish in variable proportions. The latest edition of Bergey's manual has changed the organisms originally classified as Achromobacter to Pseudomonas.

Although the existence of a definite 'generic succession of bacteria during fish spoilage has been proposed, it is uncertain whether such a succession always occurs. As the bacteria in fish muscle grow, the process is accompanied by decomposition of muscle carbohydrates, proteins and soluble nitrogenous constituents. Since the composition of the muscle of different species varies and the bacterial population involved is complex, no consistent pattern of decomposition can be expected. Very little is known about the course of breakdown of fish muscle protein by bacteria. Significant proteolysis occurs only in the advanced stages of spoilage; ammonia is liberated by the bacterial deaminization of free amino acids.

The more acid the fish muscle is. the more resistant it is to bacterial decompositon. Attempts, therefore, have been made to retard bacterial spoilage by lowering the pH values of the fish muscle below 6·0 but have not been successful because the muscle proteins become less hydrophilic and release free liquid as they approach their iso-electric zone.

On the preservation of fish by chemical means, the following compounds were among those mentioned:

(1) NaCl—Its value as a fish preservative is affected by factors such as concentration, penetration, degree of contamination with salt tolerant or halophilic micro-organisms (*Sarcina or Serratia*), and the storage temperature of the treated product.

(2) Benzoic acid and its esters—These have been used widely in some countries but are somewhat ineffective if the fish muscle pH is nearly neutral.

(3) $NaNO_2$—This is an effective bacteriostat if the fish muscle is below pH 6·5 and it does inhibit trimethylamine formation at a higher pH.

(4) Hydroxylamine—This inhibits bacterial spoilage at both acid and alkaline pH but appears to have cumulative toxic effect in animals.

(5) Antibiotics—Of the 15 antibiotics studies, aureomycin was found most effective and terramycin showed good preservative effects. For aureomycin, $\frac{1}{2}$ to 1 p.p.m. is extremely effective for direct addition and 1 to 4 p.p.m. for ices. Other uses include adding small quantities of aureomycin, to chilled sea water for holding eviscerated fish and using 50 p.p.m. in sea water in which fish are given a 1 min. dip prior to icing them in usual manner.

Tests designed to determine the bacteriological quality of fish are of two kinds: (1) those determining the size of the bacterial population, *i.e.*, direct microscopic bacterial count; (2) those which measure the products of metabolism of the organisms, *i.e.* testing for H_2S, indole, volatile acids, tyrosine,and various volatile bases. Because the spoilage of fish is extremely complicated being dependent upon factors such as the types and number of micro-flora

present, the variety of fish and the storage temperature—it has proved difficult and probably may be impossible to find a single test for determining the bacteriological quality of fish.

(FAO World Fisheries Abstracts, Vol. 7, No. 2, p. 27, March-April, 1956).

(ii) Salmon migration

The migrating behaviour of pink and chum salmon fry shows a pattern of sharp change. This discovery has an important bearing on any attempt being made to increase salmon production by producing fry under controlled conditions. Fry must be released in a manner which will take into account their migratory behaviour and the way in which it changes when schooling takes place.

Studies conducted at the University of British Columbia reveal that pink salmon which never schooled, prefer a cover of stones and do not emerge into bright light. Pink salmon fry, once they have schooled, show a strong cover reaction when exposed to a rapid increase in light but do not seek cover unless the change is abrupt. This change in behaviour occurs in 15 minutes or less when the fry school for the first time.

Chum salmon fry establish a definite direction of swimming in the quiet water of a circular channel or basin. The established direction is stable and not permanently disturbed by light or darkness, by water currents, by strong avoiding reactions, by changing the location or by excluding direct skylight.

(Canadian Fisherman, Vol. 43, No. 2, p. 12, February, 1956).

Fishing Gear & Crafts

(i) New net floats for the sea fishery

As increasingly greater depths of the sea are being trawled, the usual light-metal ball floats are being strengthened to make them retain their buoyancy at these depths. This is done by attaching 6 ring-shaped ribs round the balls. These ribs are attached to the exterior surface as well as to the interior surface of the balls. The ribs protect the metal balls from being battered, thus preventing the development of weak spots. These balls resist a pressure of upto 90 atm., i.e., 900 m (520 fm) in depth. It is impossible to replace these ball floats by those made of foam plastic. Foam plastic floats are compressed at greater depths and loose their buoyancy. Plastic hollow boats of Danish origin of 20 cm. (8 in.) in diameter and resisting a pressure of upto 40 atm. (400 m or 219 fm. in depth) are available (recently upto 50 atm.). Metal floats with steering wings are used for the midwater trawl designed by K. H. Larsson. These can also be used for bottom trawls. The same design, but heavy and without buoyancy, is used as a depressing device on the footrope of pelagic gear trawls. Very small models of this design are manufactured in Sweden operating as depressing paravanes for mackerel trolling lines. For drift nets, large floats made of plastic foil are increasingly used and these replace the old wooden barrels and canvas bladders which had been used for drift nets by the herring fishermen. The weight of the new floats is only 1·1 kg. (2·4 lb.) as compared with 8·5 kg. (18.7 lb.) of the old wooden barrels.

(F.A.O. World Fisheries Abstracts, Vol. 7, No. 2, p. 21, March-April, 1956).

(ii) Selectivity of trolling lures

The size selection of fish by gill nets is well known but the selectivity of various lures used in trolling, a method in which several weighted lines bearing numerous lures at different depths are towed through water at low speeds,

is not clearly understood and this article gives an account of the experiments carried out with four different types of lures by the Pacific Biological Station, Nanaimo, B.C., Canada, during 1953. The types of lures were large spoon, small spoon, large plug and small plug. The main conclusions are that trolling lures are selective for both species and size of salmon. Spoons catch more Coho and Spring Salmon, then plugs and spoons are more effective in catching Coho Salmon. Plugs appear to be more selective than spoons in capturing fish of different sizes. Spring salmon caught by larger lures were feeding more on fish than those caught by smaller lures, and small spring salmon which appeared to be readily taken by smaller lures were feeding either on the marine invertebrates or their stomach were empty.

(FAO World Fisheries Abstracts, Vol. 7, No. 2, p. 21, March-April, 1956).

(iii) Technique of Snag-Line Fishing

Snag-line fishing is carried out in the Southern United States. A snag-line tackle consists of from 2,000 to 10,000 hooks, spear-point hooks are individually with nylon filament twine. The lines in 500 hook sections are reefed on an iron rail which is mounted after with the clear end extending slightly beyond the stern to allow the hooks to clear the boat, when running out. Each rail will hold 1,000 hooks.

The catching qualities of Snag-line is quite amazing because no bait is used. The spoon bill and sturgeon are usually snagged.

(Commercial Fisheries Abstracts, Vol. 9, No. 2, p. 3, February 1956).

GENERAL FISHERY NEWS

Central Fisheries Technological Station:

Dr. Hideaki Miyamoto, FAO Fisheries Expert on assignment in India as a Fishing Gear Technologist arrived in India in March 1957 to advise the Government of India regarding the establishment of the Central Fisheries Technological Station (Gear wing) Cochin, to initiate and implement a programme of research work connected with testing and preserving materials that are used for fabricating different kinds of fishing gear, both modern and indigenous, compare relative efficiency of existing gear, evolve up-to-date fishing gear to suit local conditions and popularise the new fishing materials and gear in the commercial side of the industry.

Improvement of Fishing gear and fishing method Programme

Mr. John L. Burroughs assigned to India arrived in India in February, 1957, as fishing gear technician under the T.C.M. Programme to instruct local fishermen in the preparation and use of modern fishing gear in Bombay. He will also be responsible for the upkeep, repair, alteration and construction of various types of fishing gear at the Deep Sea Fishing Station in Bombay.

Mr. Charles L. Kaufman, Master Fisherman arrived in India in January 1957 on an assignment under T.C.M. to demonstrate Gill netting, Long-line fishing, trolling etc. He will be attached to the Government of India Deep Sea Fishing Station at Bombay.

F.A.O. Technical Assistance:

Mr. Mekenzie was assigned by F.A.O. as Fleet Manager to advice the Government of India Deep Sea Fishing Station, Bombay on the management of

the fishing fleet, their day to day operations, handlings of the catches etc. He arrived in the country in March 1957 and had been organizing the work in Bombay and Cochin.

Mr. T. Ishiro of Japan, an F.A.O. Expert resumed his duties as fishing Fleet Manager in West Bengal. His duties are to advise and assist the Government of West Bengal on the management of that Government's fleet of fishing vessels, including the direction and day to day operation of the fleet, the continuous maintenance of the boats, the management of the cold storage and ice-manufacturing plant, the discharge of catches, auction sales, office management and correspondence.

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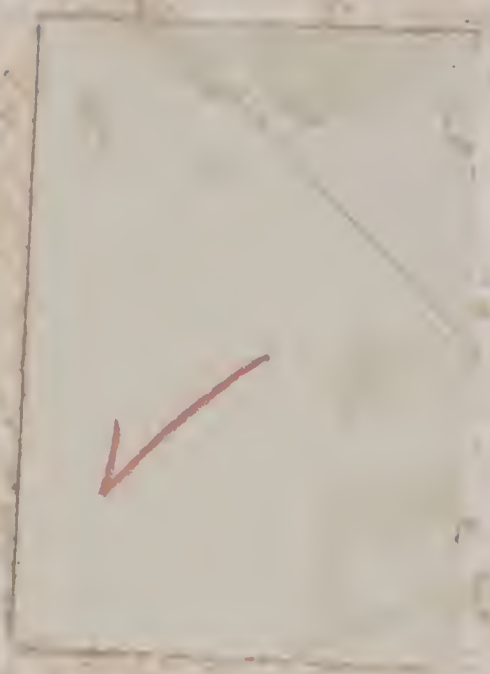

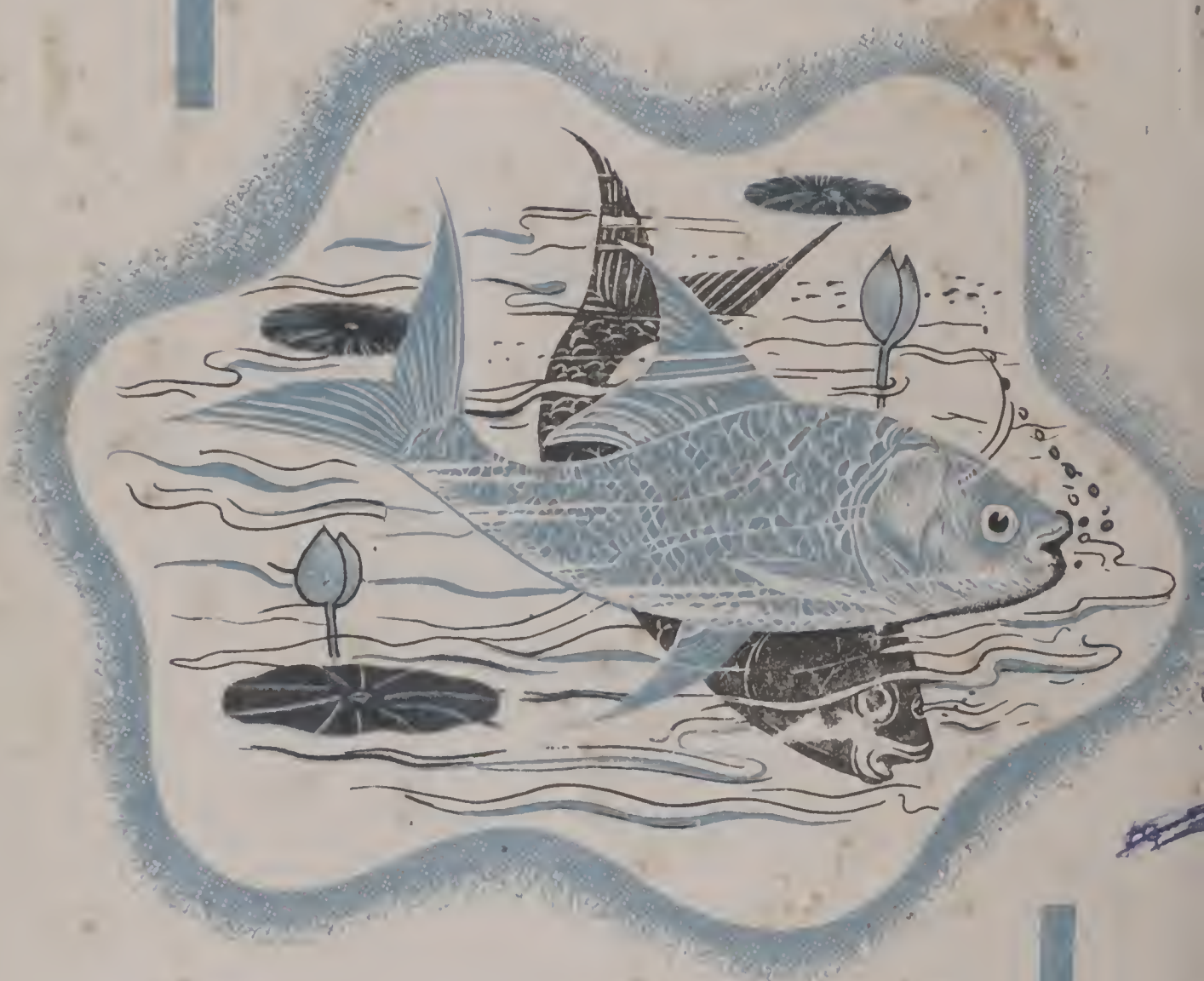

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